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PIC/JR-1001/60
November 1960

JOINT PHOTOGRAPHIC INTELLIGENCE REPORT

**HIGH-FREQUENCY
BROADCAST/BROADCAST-RELAY
STATION**

SVERDLOVSK, USSR



NAVY



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PREFACE

This joint photographic intelligence report has been prepared by the Navy and Central Intelligence Agency and fully answers their requests for a detailed photographic analysis of the Sverdlovsk High-Frequency Broadcast/Broadcast-Relay Station, USSR.

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FIGURE 1. SVERDLOVSK HIGH-FREQUENCY BROADCAST/BROADCAST-RELAY STATION. This station is 5 nm NNE of Sverdlovsk, USSR. (Date of photography) [redacted]

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INTRODUCTION

The Sverdlovsk High-Frequency Broadcast/Broadcast-Relay Station, covered by photography of [redacted] (see Figure 1) is located at 56-55N

60-41E, 5 nautical miles north-northeast of Sverdlovsk, USSR (see Figure 2). The station is situated on nearly level terrain, approximately 900 feet above sea level. It includes a fenced operations area, a housing and administration area, and a maintenance and storage area (see Figure 3). All facilities appear to be in the final construction phase. A 25-foot-wide paved road serves the station and connects with the road net in the Sverdlovsk urban area.

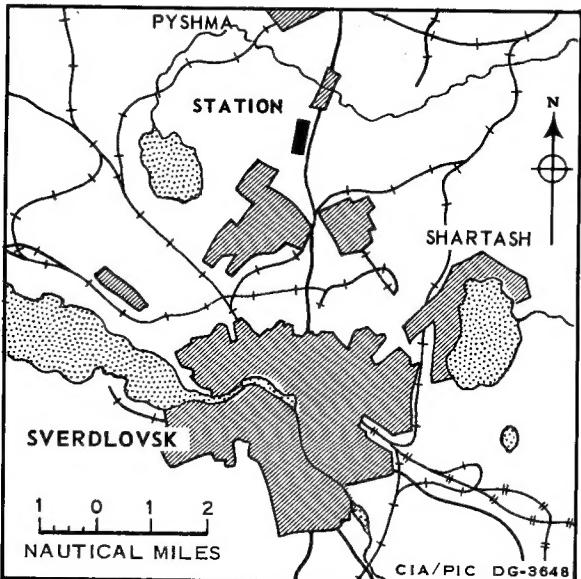


FIGURE 2. LOCATION OF SVERDLOVSK STATION.

OPERATIONS AREA

The operations area is roughly rectangular and covers approximately 436 acres (7,600 by 2,500 feet). Security provisions include a perimeter fence with eight guard towers and a gatehouse at the entrance. An internal fence restricts station personnel to the road and operational structures. The area contains 40 curtain antennas supported by 42 self-supporting lattice towers, 5 rhombic receiving antennas, 2 transmitter buildings, and 19 support-type structures.

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Curtain Antennas

The 40 curtain antennas are divided into two groups, designated East Group and West Group. East Group contains 16 curtain antennas of uniform height, width, and number of feeds (Figure 3, items a through p). West Group contains 24 curtain antennas of varying height, width, and number of feeds (items aa through xx). All curtain antennas are similar to types described in a Russian publication GOST 8805-58, Group E93, titled Transmitting Short-Wave Synphase Horizontal Wide-Band Antennas, Moscow, 1958.

All the curtain antenna feed lines are buried. The southernmost transmitter building (item A) feeds antennas a through h in East Group and antennas aa through ll in West Group. The other transmitter building (item Q) feeds antennas i through p in East Group and antennas mm through xx in West Group. The feed lines vary in length from 270 to 780 meters, with an average length of 460 meters (see Table 1).

TABLE 1. FEED-LINE LENGTHS FOR CURTAIN ANTENNAS

From	To Antenna	Length (meters)	From	To Antenna	Length (meters)
Transmitter bldg (item A)	a	400	Transmitter bldg (item Q)	i	675
	b	290		j	560
	c	270		k	440
	d	355		l	360
	e	580		m	360
	f	555		n	360
	g	570		o	425
	h	650		p	505
	aa	425		mm	500
	bb	390		nn	460
	cc	390		oo	425
	dd	360		pp	390
	ee	425		qq	360
	ff	425		rr	320
	gg	460		ss	285
	hh	675		tt	285
	ii	660		uu	360
	jj	710		vv	425
	kk	780		ww	475
	ll	640		xx	555

East Group: The 16 curtain antennas in East Group are supported by 17 towers, each 365 feet high and spaced 380 feet apart (see Table 2). The

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height and spacing of these towers suggest extensive arrays for large bandwidth, low vertical beam-angle, and high gain. Other features which could be in existence, but which cannot be proved from the aerial photography, include beam slewing and secondary lobe suppression by splitting or binominal current grading. Antennas a, b, c, d, f, h, and j have single feeds to the midpoints between their respective towers, suggesting center loading. Antennas e, g, i, and k through p have apparent "circuit-type" feed lines (see Figure 3) which suggest multiple transmitters or unusual feeding arrangements. The frequencies employed by all these antennas cannot be determined from available information. The antennas in East Group have a triatic suspension. Each tower has a heavy top-mounted spreader to support two catenary triatics -- one for the radiator curtain and the other for the reflector curtain. The large size of the arrays probably dictates the use of halyards through sheaves on the spreaders extending to ground anchors directly below, resulting in a transfer of horizontal tension to a compression load on the towers. Vertical tension is applied on the side cables and supporting wires by counterweights between ground anchors.

West Group: The 24 curtain antennas in West Group are supported by 25 towers 160 and 210 feet high, spaced 185, 240, 265, and 295 feet apart (see Table 3). The feeds vary in number from 1 to 3. In addition, the feeds to antennas hh and uu through xx have "circuit-type" feeds similar to those in East Group. The feeds to antennas ss and tt consist of three lines in circuit which suggest switching facilities for multiple transmitters and/or multiple stacks for transmitters. The rest of the antennas (the ones without special feeding arrangements) have one, two, or three transmitters, depending on the number of feed lines. Since the antennas in West Group are smaller and have more diverse feeding arrangements than those in East Group, they may be utilized for possibly higher frequencies while still maintaining low vertical beam-angle and high gain. The antennas in West Group are simpler in design than those in East Group. The antennas

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TABLE 2. DATA ON CURTAIN ANTENNAS, EAST GROUP

Tower Number	Tower Height (ft)	Distance Between Tower Centers (ft)	Antenna Letter	Number of Feeds	Primary Radiation Orientation (°)
1	365	380	a	1	
2	365	380	b	1	
3	365	380	c	1	
4	365	380	d	1	
5	365	380	e	1	
6	365	380	f	1	
7	365	380	g	1	
8	365	380	h	1	
9	365	380	i	1	
10	365	380	j	1	
11	365	380	k	1	
12	365	380	l	1	
13	365	380	m	1	
14	365	380	n	1	
15	365	380	o	1	
16	365	380	p	1	
17	365	380			

TABLE 3. DATA ON CURTAIN ANTENNAS, WEST GROUP

Tower Number	Tower Height (ft)	Distance Between Tower Centers (ft)	Antenna Letter	Number of Feeds	Primary Radiation Orientation (°)
18	210	265	aa	1	
19	210	265	bb	1	
20	210	295	cc	2	
21	160	240	dd	2	
22	160	185	ee	1	
23	160	295	ff	2	
24	210	265	gg	1	
25	210	265	hh	1	
26	210	265	ii	1	
27	210	265	jj	2	
28	210	265	kk	3	
29	210	265	ll	1	
30	210	265	mm	1	
31	210	265	nn	1	
32	210	295	oo	3	
33	160	185	pp	1	
34	160	295	qq	3	
35	160	295	rr	3	
36	160	240	ss	3	
37	160	295	tt	3	
38	210	265	uu	1	
39	210	265	vv	1	
40	210	265	ww	1	
41	210	265	xx	1	
42	210	265			

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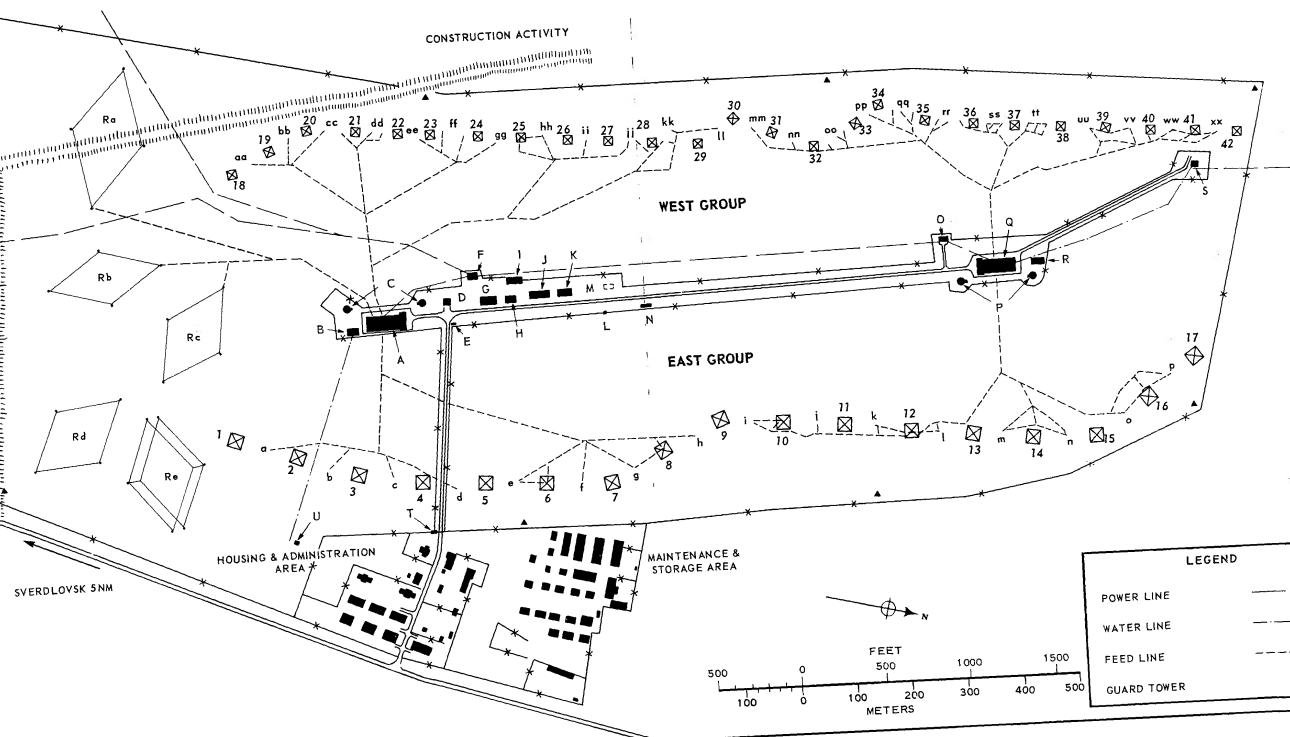


FIGURE 3. LAYOUT AND FACILITIES AT SVERDLOVSK STATION. The station has 40 curtain antennas and 5 rhombic antennas.

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are rigged between the towers with the active conductors supporting their own weight and that of their associated feeders. Probably at least four spreader bars are attached to the sides of the towers in stacks to support the radiator and reflector curtains. Both horizontal and vertical tension is maintained in a manner similar to that employed in East Area.

The primary radiation orientations of the antennas in East Group are not generally matched with those of the antennas in West Group (see Table

4). Twenty-six of the 40 antennas have radiation orientation azimuths of 80-85/260-265 degrees.

TABLE 4. ORIENTATIONS OF CURTAIN ANTENNAS

Primary Orientation Azimuth (°)	East Group (number)	West Group (number)
	1	1
	2	2
	1	1
	4	9
	3	7
	2	3
TOTAL	16	24

(antenna letters are keyed to Figure 3, and their orientations are shown on the gnomonic projection map, Figure 4).

TABLE 5. DATA ON RHOMBIC ANTENNAS

Rhombic Letter	Major Axis (ft)	Minor Axis (ft)	Side Length (ft)	Distance Between End Poles (ft)	Pole Height (ft)	Computed Tilt Angle (° ')	Orientation Azimuth (°)	Suspected Radiation Terminus
R _a	820	405	455	--	125	63-40		Moscow
R _b	720	330	395	--	110	65-00		Tashkent
R _c	720	330	395	--	110	65-00		Semipalatinsk
R _d	740	345	410	--	110	65-00		Karaganda
R _e	720	330	395	120	125	65-00		Khabarovsk

Operational Structures

The two transmitter buildings (Figure 3, items A and Q) are situated

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between the two curtain antenna groups and are connected by a service road. Each building has a modified T-shaped appearance, measures 240 by 75 feet (see Table 6), and provides 18,000 square feet of covered floor space. Each building has a flat roof with a flat-roofed monitor (10 feet high and 30 feet wide), probably for ventilation and light. Also located on the roof are two vents, each 5 feet square. Two cooling ponds, one transformer building, and one operational support building are adjacent to each transmitter building. The cooling ponds were in operation at the time of photography.

Ten buildings are located along the service road between the transmitter buildings. Three of these buildings are for operational support, 3 are for storage, one is for personnel support, 2 are for construction support, and one is under construction. Two other buildings (items S and U) are water pump houses.

Utilities

Utilities for the operations area include external power and internal water. Two overhead power lines lead into the southern section of the

TABLE 6. DATA ON OPERATIONAL STRUCTURES

Structure Letter	Description	Dimensions (feet)	Function
A	One story, monitor roof	240 x 75	Transmitter bldg
B	One story, gable roof	70 x 35	Operational support bldg
C	Circular	50 (dia)	Cooling pond
D	One story, gable roof	55 x 45	Operational Support bldg
E	One story, flat roof	25 x 20	Operational support bldg
F	One story, flat roof	65 x 25	Transformer bldg
G	One story, hip roof	105 x 45	Personnel support bldg
H	One story, flat roof	55 x 25	Operational support bldg
I	One story, gable roof	100 x 45	Storage bldg
J	One story, shed roof	120 x 30	Storage bldg
K	One story, shed roof	90 x 25	Storage bldg
L	One story, shed roof	20 x 20	Construction support bldg
M	U/C	115 x 25	
N	One story, shed roof	75 x 20	Construction support bldg
O	One-story, flat roof	55 x 30	Transformer bldg
P	Circular	50 (dia)	Cooling pond
Q	One story, monitor roof	240 x 75	Transmitter bldg
R	One story, gable roof	70 x 35	Operational support bldg
S	One story, flat roof	25 x 20	Water pump house
T	One story, gable roof	25 x 20	Gatehouse
U	One story, flat roof	25 x 20	Water pump house

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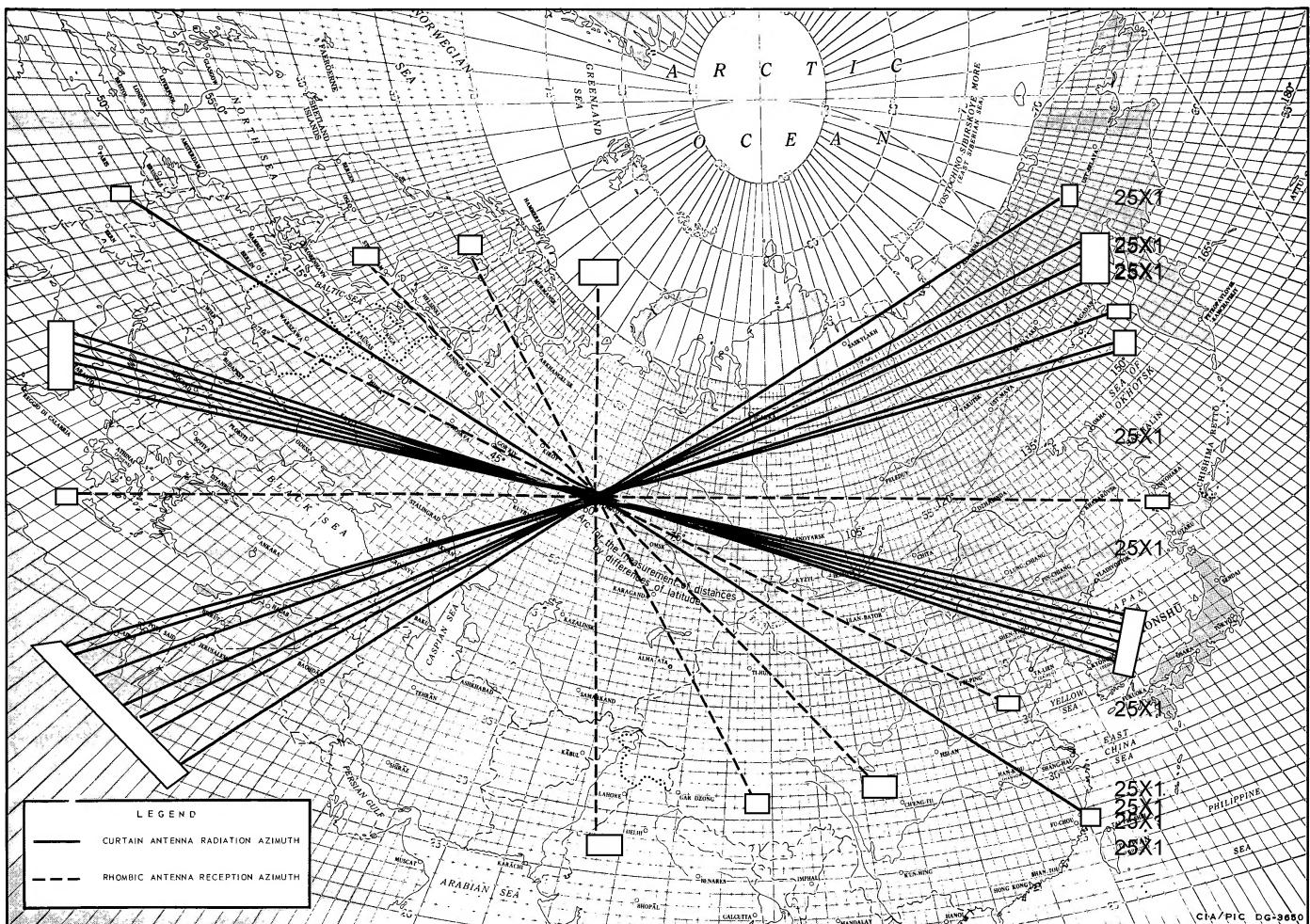


FIGURE 4. GNOMONIC PROJECTION MAP, showing areas covered by antennas at Sverdlovsk high-frequency broadcast/broadcast-relay station.

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operations area and terminate at one of the transformer buildings (item F). A secondary power line leads from transformer building F to transformer building O. From each transformer building overhead lines lead into the transmitter buildings. A buried water line leads from pump house S to operational support building R. Another buried water line leads from pump house U to operational support building B. No communications lines are visible on the photography.

HOUSING AND ADMINISTRATION AREA

The housing and administration area is east of the operations area on the south side of the entrance road. This area contains 10 major structures of which 3 are family-type quarters, 3 are barracks-type quarters, 2 are bathhouses, and 2 are administrative-type buildings. The family-type quarters have 28,500 square feet of floor space. The barracks-type quarters have 21,000 square feet of floor space.

MAINTENANCE AND STORAGE AREA

The maintenance and storage area is east of the operations area on the north side of the entrance road. This area contains 29 major structures, 2 motor pools, and 4 open-storage sites. The total covered floor space in the area is approximately 94,000 square feet.

CONCLUSIONS

At the time of photography, the Sverdlovsk Broadcast/Broadcast-Relay Station appeared to be in the final or nearly complete construction phase and may have been partially operational, as evidenced by the working cooling ponds. This station will probably broadcast programs which originate here along with programs which originate elsewhere.

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REFERENCES

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PHOTOGRAPHY



MAPS or CHARTS

WAC 156 (U)

AMS. Series N 502, Sheet NO 41-10, 1st ed, Dec 55 (U)

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